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N I L U X – S N S *Additives for sulfamate nickel applications*

Introduction

Sulfamate nickel plating is used in several applications which require special deposit characteristics – low internal stress, ductility, the ability to be machined etc. The **NILUX - SNS** series of products for sulfamate nickel plating are formulated to meet these characteristics. **NILUX – SNS** products adapt to most specific needs: barrel and rack, bright and semi-bright. **NILUX – SNS** provides dependable results with maximum operator ease.

Features and benefits

Versatile products	Adaptable to most applications
Wide operating parameters	Easy to control

Plating with the NILUX – SNS nickel bath

Chemical concentrations

Nickel as metal:	10.2 oz/gal
Nickel sulfamate:	43.6 oz/gal
Anode corroder:	As required
Boric acid:	4.0 oz/gal
pH:	3.8 – 4.2 (rack plating) 3.2 – 3.8 (barrel plating)
NILUX – SNS Carrier	0.01 - 1 % by volume
NILUX – SNS Wetting Agent	0.1 - 0.25 % by volume

Operating Guidelines

Tanks and equipment	Lined steel or heat-resistant plastic
Anodes	Sulfur depolarized required
Anode baskets	Titanium, bagged
Filtration	Continuous
Agitation	Mechanical or filtered air
Temperature	110 – 140 ⁰ F
Cathode current density	5 - 500 amps per square foot
Anode current density	3 - 200 amps per square foot

Function of bath components

- Nickel metal is provided by the nickel sulfamate. Nickel deposits from this chemistry yield specialized characteristics that other bath formulations cannot provide.
- The sulfamate ion is not highly corrosive, so an anode corrosion aid is required. The choice of anode corroder can vary. For the most critical optical or electroforming applications, ultra-high purity magnesium chloride is required. For applications which require high ductility, such as electrical contacts, purified nickel bromide is preferred. For all other applications, purified nickel chloride is acceptable. The concentration must be determined by in-house evaluation. In general, the corroder must be maintained so that nickel concentrations and pH are maintained within appropriate ranges.
- Boric acid is recommended to buffer pH, but is not always necessary. When used, the concentration should be maintained near the saturation point. This varies from approximately 4 to 6 ounces per gallon, depending on the operating temperature of the solution.
- **NILUX – SNS Carrier** acts as a grain refiner for the nickel deposit. This makes the nickel deposit much harder than the plate from a plain solution. Additionally, **NILUX – SNS Carrier** provides some degree of brightness to the deposit, even at very low concentrations.
- **NILUX – SNS Wetting Agent** improves the solution contact with the surface to be plated, reduces the tendency to pit, and provides some tolerance for organic contaminants.

New bath make-up (100 gallons)

Nickel sulfamate concentrate (24 oz/gal as Ni):	42.5 gallons
Boric acid (4.0 oz/gal):	25 pounds
pH:	Adjust as required with a dilute solution of sulfamic acid
NILUX - SNS components:	Follow suggested guidelines for specific application

Preparation of new solution

- 1) Carefully review all equipment to verify that tanks, pumps, heaters, and related items meet the requirements for the work this line will do.
- 2) Thoroughly clean all tanks and equipment. Use a separate tank for bath prep if available.
- 3) Fill tank $\frac{1}{2}$ full with high-purity deionized water.
- 4) While agitating (mechanical preferred) slowly add chemicals and mix thoroughly.
- 5) Bring solution to 90% of final volume, mix well, and adjust pH of solution. If pH is high, add dilute sulfamic acid solution to reduce; if pH is low, add $\frac{1}{2}$ pound nickel carbonate powder per 100 gallons to raise pH. Allow to dissolve completely before rechecking pH. Continue adjustments until pH is within range.
- 6) Add appropriate combination of **NILUX SNS** components and mix well. Dilute to final volume and mix. Analyze solution and fine-tune balance.
- 7) Electrolyze new solution at low current (< 0.5 amp/ft²) for 24 hours prior to production.

Conversion of existing baths

NILUX SNS components are fully compatible with most existing systems, so that a simple "slide-in" conversion is acceptable. It is common to allow existing additives to deplete as much as possible while still producing acceptable work. We suggest that a representative sample of the solution be sent to Accu-Labs, Inc. for analysis and Hull cell testing. We will then advise the best conversion method.

Pretreatment for sulfamate nickel plating

Proper conditioning of the work to be plated is critical to successful plating operation. Work must be clean and free of metalworking lubricants, rust, fines, mold releases, and so on. Consult with your sales representative or Accu-Labs, Inc. for information and assistance with pretreatment products.

Nickel anodes

Only high-purity nickel anodes should be used. In general, rolled, sulfur-depolarized anodes are recommended as the best choice to for rack applications; sulfur-depolarized chips are preferred for barrel. Consult with your Accu-Labs Technical Sales Representative for more information on anodes for your application. Maintain an anode to cathode ratio of 2:1.

Due to the non-corrosive characteristic of the sulfamate ion, anodes may polarize. This can occur even with the use of sulfur-depolarized anodes. If this occurs, check the anode-to-cathode ratio in your tank. Remove some of the anodes if the ratio is high. If the ratio is correct and anodes still polarize, you may need to raise the concentration of the anode corroder. In general, if nickel metal levels drop or pH rises during plating, there is an anode problem.

Anode baskets should be constructed from titanium, which will not corrode in the properly maintained nickel solution. Anodes should also be bagged to retain nickel fines.

Filtration and purification

For sulfamate nickel, filtration is critical: even small particulates will affect the quality of the plating. Depending on the type of solid contaminant, either pitting or roughness can result.

Filtration should be continuous with media capable of five-micron retention. Turnover should be three times per hour. Activated carbon can be used in filtration on a regular basis to maintain organic contaminants at a tolerable level.

Even with carbon-packed filter units, a thorough carbon treatment may sometimes be required. This is the result of a various organic impurities from multiple sources. Consult with your sales representative or Accu-Labs for information and assistance with purification.

Metallic contamination is usually caused by work lost in the plating tank, drag-in from pickling, corrosion of busing, or leaks in the tank liner. Proper equipment maintenance is the best way to avoid problems. Low-current dummyming may be required when contamination is more severe. Avoid addition of oxidizing agents, such as peroxide or permanganate, as these can break down the sulfamate ion as well. The resultant sulfate and ammonium ions will have a deleterious affect on the plating solution.

HANDLING: Always wear proper personal protective gear when working with or around this or any chemical product; read MSDS prior to use.

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